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APPLICATION OF LANDSAT-2 DATA TO THE IMPLEMENTATION AND ENFORCEMENT OF  
THE PENNSYLVANIA SURFACE MINING CONSERVATION AND RECLAMATION ACT

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FOR PERIOD SEPTEMBER 19 - DECEMBER 19, 1975

Prepared for:

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APPLICATION OF LANDSAT-2 DATA TO THE IMPLEMENTATION  
AND ENFORCEMENT OF THE PENNSYLVANIA  
SURFACE MINING CONSERVATION AND RECLAMATION ACT

TYPE II - Progress Report

For Period September 19 - December 19, 1975

Introduction to Project Objectives

The central objectives of the Pennsylvania LANDSAT Investigation are:

- To prepare information products from analysis of LANDSAT and aircraft imagery to rapidly and effectively implement the regulatory provisions of Pennsylvania's Surface Mining Conservation and Reclamation Act.
- To develop and operationally implement a monitoring system, within one or more detailed study sites, which will include surface mine disturbance change detection, reclamation status monitoring and mined lands inventory updating.
- To provide utilitarian regulatory information products to line agencies within the Pennsylvania Department of Environmental Resources.

## Problems

The second underflight in support of the Pennsylvania LANDSAT investigation was flown by NASA Ames on 23 October 1975 (Flight No. 75-183). A flight summary report indicates 10 to 50% cirrus cloud cover on most flight lines with slight underexposure of color infrared imagery. Suboptimal image quality may reduce the value of these underflight data for confirmation of surface mining disturbance and reclamation interpretations of time-series LANDSAT data.

## Accomplishments

Third quarter activities: The most important accomplishments which were made during the third quarterly performance period include:

- Discussions with Mine Land and Water Conservation District inspectors and their regional supervisory inspector-at-large concerning inspection procedures, information requirements, LANDSAT information delivery potential, and LANDSAT information product format options..
- Completion of a surface mining land disturbance inventory data base for Conservation District No. 36, at a scale of 1:125,000, from manual interpretation of color infrared aerial photographic underflight data flown by NASA Ames (see Figure 1 and discussion under the heading "Aircraft Data").
- Preparation of a series of photographically and digitally-enhanced LANDSAT image and data products from the best of LANDSAT-1 and LANDSAT-2 over the south Clarion study area. Working scales of image and data products ranged from 1:125,000 to 1:24,000.

- Preliminary evaluation of LANDSAT surface mining regulatory information delivery capability through interpretation of LANDSAT imagery and data products. LANDSAT interpretation was aided by comparison with the mining disturbance inventory data base.
- Presentation of preliminary LANDSAT information delivery capabilities to Pennsylvania Bureau of Surface Mine Reclamation representatives, and discussion of the most promising practical LANDSAT data applications and information delivery formats.

Other lesser accomplishments made during the third quarterly reporting period include the following:

- Submission of underflight data requests to the EROS Data Center in Sioux Falls for the second set of aerial photographic data acquired by NASA Ames on 23 October 1975 (Flight No. 75-183).
- Preliminary evaluation of photographically produced LANDSAT multi-date image composites for mine land change detection information.
- Selection of the Clarion 7.5-minute USGS quad sheet for use as an intensive study area for evaluation of 1:24,000 scale LANDSAT digitally-derived information delivery capabilities.

Planned fourth quarter activity: Investigative effort during the next quarterly reporting period from December 19, 1975 to March 19, 1976 is expected to be directed primarily toward the following specific tasks:

- Production of a barren to partially revegetated surface mining land disturbance inventory from LANDSAT digital data. Disturbance inventory data will be utilized by the Pennsylvania Bureau of Surface Mine Reclamation as an aid to achievement of full implementation of regulatory permit controls over all forms of surface mining as required by specific provisions of the Surface Mine Conservation and Reclamation Act.
- Development of a multi-stage sampling design for generation of periodic digitally-derived LANDSAT surface mining activity and reclamation status monitoring reports. These reports are expected to provide regulatory management personnel with information useful for evaluation of mining regulatory system performance and Conservation District new mining activity trends.

### Significant Results

The most promising practical information delivery potential of LANDSAT data for the Pennsylvania Surface Mining Regulatory System, as that system is currently organized and functioning, lies in periodic sub-regional (District) mining disturbance activity and reclamation status evaluation reports derived from application of multi-stage sampling techniques.

The results of LANDSAT mining regulatory investigative work performed to date have strongly suggested the advisability of a significant re-direction of future applied research effort toward meeting supervisory management level, rather than toward meeting detailed on-site inspection level, information requirements; preliminary analysis has further suggested that application of multi-stage sampling techniques with



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### Publications

None.

### Recommendations

Specific recommendations for an expansion of originally-planned digital processing effort to include demonstration development of a geo-coded, mining permit boundary information base will be proposed to NASA during coming months.

### Funds Expended

Total fund expenditures incurred through November 30, 1975 amount to \$16,321.68.

### Data Use

<u>Type of Data</u>	<u>Value of Data Allowed</u>	<u>Value of Data Ordered</u>	<u>Value of Data Received</u> <sup>1/</sup>
LANDSAT	\$3,200	\$1,085	\$1,085
CCT	3,000	1,000	200
Aircraft	8,532	3,900	1,842

### Aircraft Data

Underflight data from NASA Ames Missions 75-018C and 75-037B were utilized for development of a Strip Mine Land Disturbance Inventory of southern Clarion county. A reduced scale copy of the Strip Mine Disturbance Inventory overlay has been reproduced in Figure 1.

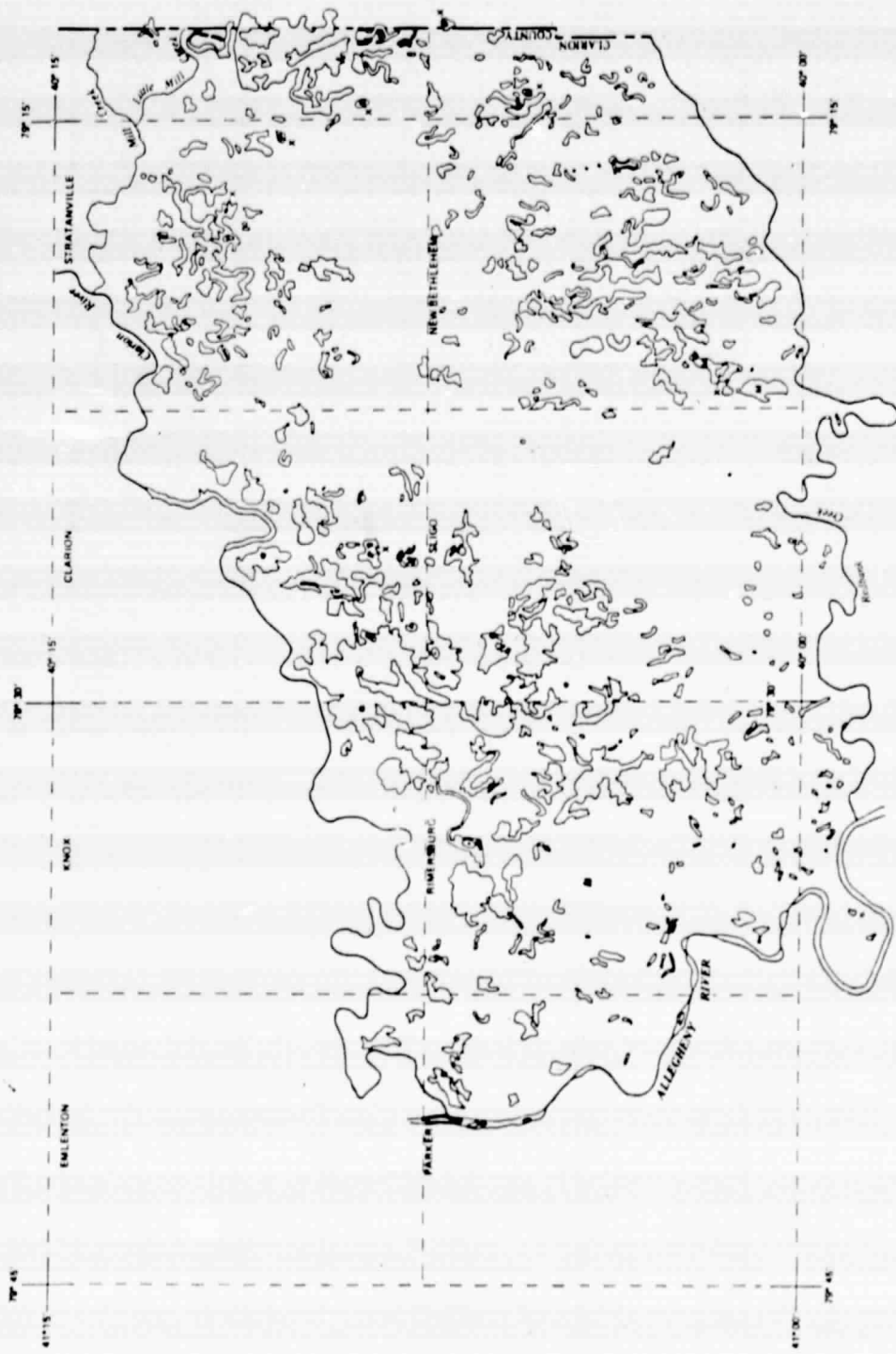
<sup>1/</sup>

Based on EROS Data Center account statements of December 31, 1975.

# LANDSAT-2 FOLLOW-ON INVESTIGATION PROGRAM

## SURFACE MINING LAND DISTURBANCE INVENTORY

### SOUTH CLARION COUNTY, PENNSYLVANIA



#### LEGEND

- SURFACE MINING DISTURBANCE
- UNDISTURBED AREA WITHIN A SURFACE MINING DISTURBANCE
- MINING DISTURBANCES INTIMATELY MIXED WITH UNDISTURBED AREAS
- DISTURBED AREA ASSOCIATED WITH COAL PROCESSING ACTIVITY
- CLARION U.S.G.S. 7 1/2 QUADRANGLE SHEET NAME

SCALE 1:125,000  
10 Statute Miles

UNCONTROLLED BASEMAP OVERLAY PREPARED FROM  
INTERPRETATION OF 1:125,000 SCALE HIGH ALTITUDE  
CIVIL AERIAL PHOTOGRAPHY FLOWN BY NASA AMES RE  
SEARCH CENTER ON 22 FEBRUARY AND 11 APRIL 1975.

PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL RESOURCES  
BUREAU OF SURFACE MINE RECLAMATION  
MINE LAND AND WATER INSPECTION DISTRICT 38

prepared by  
**EARTH SATELLITE CORPORATION**  
during December 1975  
under LANDSAT-2 Follow-on Investigation Program

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FIGURE 1

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

The Strip Mine Inventory was prepared from manual interpretation of 1:125,000 scale color infrared high altitude photography. Delineations were recorded on contact scale black-and-white positive mylar transparencies made from the aerial photography. Low-to-moderate contrast details of surface disturbances were transferred to the mylar base by stereoscopic viewing of the mylar base with adjacent color infrared frames. Delineations performed on each individual contact scale mylar were then transferred to a single overlay base by consecutive registration of each image sub-area across each frame with a 1:125,000 scale clear overlay reproduction prepared from the 1:250,000 scale USGS topographic map base.

The resultant 1:125,000 scale land disturbance inventory overlay for southern Clarion county has been used as a surface mining data base to assess the information delivery potential of photographically and digitally processed and enhanced LANDSAT data at the same 1:125,000 working scale.

Orders have been placed with the EROS Data Center for imagery from the second scheduled underflight mission flown by NASA Ames in support of the Pennsylvania investigation (Flight #75-183).